REMARKS

Claims 11-17, all the claims pending in the application, stand rejected. Claim 15 has been amended. The Examiner's kind suggestions for improving the clarity of the claims are appreciated and adopted. In addition, the claims have been amended to more accurately define the invention, consistent with the original disclosure as would be understood by one skilled in the art. Specifically, claim 11 now states that it is the light from an object (whether reflected or transmitted) that is detected, and that the light is generated by plural scanning beams. In addition, the claim now clarifies that the plural scanning beams scan along a common axis. Claim 15 also has been amended to clarify that the plural scanning beams scan along a common axis. The reference to a "first common axis" and a "second common axis" is made for consistency in the two claims. No new matter is added.

Claim Objections

The Examiner provides several examples where claim 15 is considered to be indefinite. These examples are addressed in order and Applicant respectfully submits that the claim is clear and definite.

First, the Examiner finds the recitation of first, second and third pluralities to be misleading, as the Examiner assumes that there is only one plurality of pixels and one plurality of concurrently scanning beams. Applicant has deleted the word "third" with reference to the number of beams.

Second, the Examiner finds the phrase "detecting a plurality of pixels stored" to be indefinite. The Examiner states that pixels are not detected, but that the "pixels detect incident light and store a signal that represents the value of said light." The claim has been amended to

refer to "detecting signals representing values of light for a plurality of pixels that are stored," consistent with the Examiner's suggestion.

Third, the Examiner suggests that the word "scanning" should be inserted before the word "beams" at line 5, in order to provide consistency. Such change has been made.

Fourth, the Examiner finds that the phrase "concurrently serially" is self contradictory. Applicant has further explained that the concurrent activity relates to the plurality of sections, which are serially read out at the same time.

Claim Rejections - 35 USC 103

Claims 11-17 are rejected under 35 USC 103(a) as being unpatentable over Kusunose (6,043,932) in view of Kiik et al (EP 0 866 502 A). This rejection is traversed for at least the following reasons.

Kusunose

The patent to Kusunose has been cited by the Examiner for a teaching in Fig. 1 of a linear light detector apparatus for detecting a plurality of concurrently scanning spot beams, which comprises a plurality of adjacent light detector sections (11a-11c) that are disposed linearly along a common axis. However, the structure of Kusunose is fundamentally different from that of the present invention in that the plural scanning beams, as illustrated in Fig. 2(A), do not scan along a common axis. As is clear from the Figure, and the description of the multiple spot illumination technique disclosed in Kusunose (see in particular col. 7, lines 3-8 and lines 58-65), a single beam is divided into an array of fine light spots that are aligned in a direction orthogonal to the direction of scan. The plural beams move along horizontal scan lines that are parallel to each

other in an orthogonal direction, so that an entire two-dimensional area of a specimen 30 may be scanned in a single scan.

The present invention generates plural spots that scan along a common axis, as is clear from the illustration in Figs. 1 and 4. Even if each of the plural spots are divided by a Damman grating or beam splitter into sub-beams, as in Fig. 6A, groups of the sub-beams will themselves be disposed along a common axis, such that the beams as a whole will scan along a common axis. The claims have been amended to define this distinctly different focus of the invention. In particular, independent apparatus claim 11 now recites that "light from an object that is generated by a plurality of concurrently scanning spot beams that scan the object along a first common axis" is used. Method claim 15 further includes a step of "receiving an input from a respective one of a plurality of concurrently scanning beams that scan an object along a second common axis."

Second, since Kusunose is concerned about a laser microscope, which is intended to capture a two dimensional image rapidly, the scanning of multiple beams in parallel paths is highly desirable. Scanning plural beams along a common axis, and capturing the image line by line, as in the present invention, is undesirable and contrary to the purpose of the laser microscope in Kusunose.

Third, as a further distinction, the Examiner admits that Kusunose does not teach a multi-stage storage device, as claimed. The Examiner looks to Kiik for a teaching of a multi-stage storage device and asserts that the structures of the two references may be combined to render the invention obvious. Kiik does not remedy the deficiencies of Kusunose and Kiik in combination with Kusunose does not teach the present invention.

Kiik et al

Significantly, Kiik is not cited to remedy the deficiencies of Kusunose, nor can it do so as there is no discussion of the manner in which an input to the sensors 102 is generated and certainly no discussion of concurrent scanning beams that scan along a common axis. Notably, the Examiner has withdrawn his earlier assertion that scanning beams is taught in the reference in col. 1.

Even as to the sensor arrangement itself, as previously noted and as repeated in the present Office Action, the Examiner cites Kiik et al for a disclosure of a linear light detector apparatus 100 that has a plurality of adjacent light detector sections (102, 104) that are disposed linearly along a common axis, as illustrated in Fig. 1. The Examiner asserts that each detector section has at least one multi-stage storage device 110 operative to receive in parallel an input from the plurality of light detectors and to serially read out 112 information stored in the multiple stages. The Examiner notes that each storage device 110 has a plurality (4) of registers, each register having plural (4) vertical register elements e.g., 110AA-110DA, as illustrated in Fig. 3. Notably, each of these registers is vertical and adapted to transfer signals from the top to the bottom of each column.

The structure of Kiik is focused on two-dimensional imaging arrays, particularly frame transfer sensor that take a "snapshot" of an image (col. 2, lines 46-57), where the frame is formed by an interline transfer sensor 20 (Fig. 8, lines 4-18) or TDI linear array sensor 30. The description of the invention in Kiik at col. 5, lines 22-48 is clearly focused on two dimensional image capture. The imaging section 102, which is illustrated in Fig. 1 and described at col. 5, lines 25-27, is not otherwise described and would appear to be any of the structures illustrated in

Figs. 7-9 where there are arrays of photosites, comprising a plurality of photosites in a column, so that multiple pixels may be captured. There clearly is no teaching or suggestion that signals resulting from a scan of plural beams along a common axis may be captured, stored and read out in the manner claimed. Moreover, the requirement in Kiik for the captured charges to be integrated, leads to a requirement that the same image should be captured by successive lines of photosites, as particularly explained with respect to the integrated TDI sensor at col. 2, lines 20-45 of the reference.

In sum, nothing in the disclosure of Kiik et al remedies the deficiencies of Kusunose, or otherwise teaches or suggests the key features of the present invention, namely, the ability to simultaneously capture the images from plural concurrently scanning beams along a common axis, using a linearly arranged detector structure, and to serially read out the captured images in parallel.

Claim 11

With regard to claim 11, the claim now specifies that now recites that "light from an object that is generated by a plurality of concurrently scanning spot beams that scan the object along a first common axis" is used. This recitation is coupled with a recitation that the plurality of adjacent light detectors, which form each detector section, are disposed linearly along the second common axis that is shared by the plural detector sections. This positional relationship, especially with respect to the plural concurrently scanning spot beams and detector sections, is unique and is not taught in Kiik et al or Kusunose.

Claim 15

With regard to claim 15, the fundamental feature of the invention based upon detection and storage of the content of a plurality of concurrently scanning beams where the method includes a step of "receiving an input from a respective one of a plurality of concurrently scanning beams that scan an object along a second common axis" is not found in Kusunose or Kiik et al. Indeed, nothing in either reference indicates that the advantages of plural concurrent scans along a common axis and the detection of the light from those scans was recognized. Moreover, there is nothing to teach how to overcome the challenges that would arise from implementing plural concurrent scans along a common axis. Only the Applicants first identified those problems and the solutions to those challenges, based upon the invention as presently claimed.

Dependent Claims

The claims dependent on independent claims 11 and 15 further specify or amplify the unique features of the invention as applied to the detection of concurrently scanning beams along a common axis, which are not taught in Kusunose or Kiik et al, including claims 12 and 14.

As to claim 13, again the Applicant notes that the claim requires the temporary shift register to receive in each stage in parallel the content of a corresponding detector. In Kiik et al, each of the registers in storage device 110 is structured with its stages oriented vertically (110AA-110DA), by the Examiner's own characterization, and cannot receive the signals in each stage in parallel. Separate columnar registers receive signals, but they are not of a corresponding detector.

Finally, the synchronizing step of claim 16 clearly cannot be taught in the absence of plural scanning beams along a common axis, and the concurrent capturing and storing in only a portion of the sections, as recited in claim 17, is not taught in Kiik et al or Kusunose et al, by the Examiner's own admission. Within the environment of a plurality of scanning beams that scan along a common axis, the claimed feature cannot be obvious.

Present Claims are Patentable

The combination of Kusunose and Kiik do not meet the presently claimed invention. First, with respect to the invention as now claimed, the light detector is specified as being "linear," which suggests to one skilled in the art that the elements are arranged along a common axis. This arrangement is clear from the illustration in Fig. 5 for sections 502. As already noted, the sections are disposed linearly along a common axis, consistent with the overall "linear" character of the detector. Finally, claim 11 specifies that each of the plural detector sections is positioned to detect light concurrently with other detector sections from a respective scanning beam and comprises light detector elements that are (1) adjacent and (2) disposed linearly along the common axis.

Second, with respect to the advantages of the unique combination of elements or steps, as claimed, the light from plurality of concurrently existing and respective scanning light beams can be captured as the beams traverse along a common axis on an object. The enhanced efficiencies and speed provided when a given linear area is scanned concurrently by plural beams, rather than a single beam, is readily apparent. Nothing of this sort is taught in the prior art.

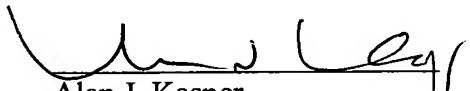
The result in the stated environment is significant because the scanned objects (particularly in the case of semiconductor chips or dies) can be moved past the detection section

of a production line at a higher rate of speed than would otherwise be possible with a linear detector that has only a single beam along an axis and only a single line of detection elements. The combination of (1) a concurrent detection of plural scanning spot beams that scan along a common axis and (2) the parallel capture and readout of the data in parallel serial streams provides a unique structure that is not found in the prior art.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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